

Cond
A5

where NA1 is the maximum numerical aperture of said illumination area forming optical system on a light source side, β is the imaging magnification of said illumination area forming optical system, and NA2 is the maximum numerical aperture of said projection optical system on said photosensitive substrate side.

REMARKS

Claims 1-45 are pending. By this Amendment, claims 1, 22, 30, 36 and 43 are amended, claims 46-66 are canceled, and the Abstract and Fig. 1 are amended. The attached Appendix includes a marked-up copy of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. §1.121(c)(1)(ii)).

Independent claims 1 and 30 are amended to more clearly recite that the imaging optical system is located between the illumination area defining unit (or, regarding claim 30, the position where the predetermined area is defined) and the mask. It is believed that this feature was inherent in claims 1 and 30 because those claims already recite that the imaging optical system forms the illumination area on the mask by projecting the predetermined area onto the mask. Claim 1 is further amended to clarify that the adjusting unit adjusts an optical characteristic of the imaging optical system. Claims 22, 36 and 43 are amended to correct typographical informalities; the amendments to these claims do not narrow their scope.

The Examiner is requested to consider the U.S. Patent enclosed with the attached Information Disclosure Statement. The U.S. Patent is the U.S. counterpart of JP-A-11-329963, previously considered by the Examiner.

Applicants note with appreciation the allowance of claims 14-27 and 36-45. It is believed that claim 29 also should have been included because claim 29 depends from allowed claim 14. Applicants also note with appreciation the indication of allowable subject matter in dependent claims 3, 4, 32 and 33. Applicants respectfully submit that all pending claims are in condition for allowance for at least the reasons set forth below.

The Office Action objected to the Abstract and Fig. 1. The attached substitute Abstract removes "comprising", which was objected to in the Office Action. Fig. 1 is amended in the attached Request for Approval of Drawing Corrections in order to label boxes 40-44. Withdrawal of these informality objections is requested.

Claims 1, 2, 5-13, 28, 30, 31, 34 and 35 stand rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,591,958 to Nishi et al. or U.S. Patent No. 5,721,608 to Taniguchi. These rejections are respectfully traversed.

Independent claim 1 recites, *inter alia*, an adjusting unit that adjusts an optical characteristic of an imaging optical system, wherein the imaging optical system is located between the mask and an illumination area defining unit which defines a predetermined area corresponding to an illumination area that is to be formed on the mask. Independent claim 30 recites, *inter alia*, the steps of defining a predetermined area corresponding to an illumination area to be formed on a mask, forming the illumination area on the mask by projecting the predetermined area onto the mask using an imaging optical system that is located between the position where the predetermined area is defined and the mask, and adjusting an optical characteristic of the imaging optical system. Examples of such structure and steps are provided in the specification at, for example, page 18, lines 16-24, page 28, lines 3-13, page 40, line 10 – page 51, line 24 and page 102, lines 4-14. Also see, for example, Fig. 5, which illustrates one example of an imaging optical system that is located between the structure (30) that defines the predetermined area that is to be illuminated onto the mask, and the mask.

Neither Nishi et al. nor Taniguchi discloses or suggests the claimed adjusting unit or step. Lenses 50 and 51 are located between the field stop 49 and the mask 12 of Nishi et al. Nishi et al. does not disclose or suggest adjusting lenses 50 and/or 51. Lenses 7b and 10, as well as mirror 9, are located between the reticle blind 8 and the reticle R of Taniguchi.

Taniguchi does not disclose or suggest adjusting any of lenses 7b and 10, or mirror 9.

Accordingly, neither Nishi et al. nor Taniguchi et al. discloses or suggests the combinations of features/steps recited in independent claims 1 and 30 or their dependent claims.

Withdrawal of these rejections is requested.

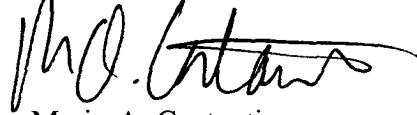
Claims 1, 2, 30, 31, 34 and 35 stand rejected under 35 U.S.C. §102(b) over U.S. Patent No. 4,780,740 to Suzuki et al. or U.S. Patent No. 4,668,077 to Tanaka. These rejections are respectfully traversed.

Neither Suzuki et al. nor Tanaka discloses or suggests the combinations of features/steps recited in independent claims 1 and 30. Suzuki et al. does not disclose or suggest adjusting any optical elements located between the illumination area-defining reticle blind 13 and the reticle R. In fact, no optical elements are disclosed as existing between elements 13 and R of Suzuki et al. Taniguchi et al. does not disclose or suggest adjusting any optical elements located between reticle blind 12 and mask M. In fact, like Suzuki et al., no optical elements are disclosed as existing between reticle blind 12 and mask M of Tanaka. Withdrawal of these rejections is requested.

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

Should the Examiner believe anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,



Mario A. Costantino
Registration No. 33,565

MAC/djb

Attachments:

Substitute Abstract
Appendix
Request for Approval of Drawing Corrections
Information Disclosure Statement
Petition for Extension of Time

Date: March 26, 2003

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>
--



APPENDIX

Changes to Abstract:

The following is a marked-up version of the amended Abstract.

ABSTRACT OF THE DISCLOSURE

An exposure apparatus exposes a transfer pattern of a mask onto a photosensitive substrate in an overlapping manner. The exposure apparatus ~~comprises~~includes an illumination optical system for guiding illumination light to the mask. An imaging optical system in the illumination optical system forms an illumination area on the mask. The exposure apparatus ~~comprises~~includes a lens driving apparatus. The lens driving apparatus moves at least one of the lenses constituting the imaging optical system along the optical axis and so forth, thereby correcting an optical characteristic of the imaging optical system.

Changes to Claims:

Claims 46-66 are canceled.

The following is a marked-up version of the amended claims:

1. (Amended) An exposure apparatus for exposing a transfer pattern of a mask onto a photosensitive substrate in an overlapping manner, so as to expose a pattern larger than said transfer pattern of said mask onto said photosensitive substrate;

said exposure apparatus comprising:

a light source unit for supplying illumination light; ~~and~~

an illumination optical system for guiding said illumination light to said mask

having said transfer pattern;

said illumination optical system comprising:

an illumination area defining unit, disposed at a position substantially optically conjugate with said mask, for defining a predetermined area corresponding to an illumination area to be formed on said mask; and

RECEIVED
MAR -2 2003
TECHNICAL ROOM

an imaging optical system, between the illumination area defining unit and the mask, for forming said illumination area on said mask by projecting said predetermined area defined by said illumination area defining unit onto said mask;

said exposure apparatus further comprising:

an adjusting unit for adjusting an optical characteristic of said imaging optical system so as to adjust an optical characteristic in said illumination area formed on said mask or in an exposure area formed on said photosensitive substrate.

22. (Amended) An exposure apparatus according to claim 14, further comprising a measuring unit for measuring said optical characteristic;

wherein said adjusting unit carries out said adjustment based on a result of measurement ~~effect~~ obtained by said measuring unit.

30. (Amended) A method of manufacturing a microdevice,

said method comprising:

an illumination step of illuminating a mask having a transfer pattern with illumination light; and

an exposure step of exposing said transfer pattern of said mask onto a photosensitive substrate in an overlapping manner;

said illumination step including:

an illumination area defining step of defining a predetermined area corresponding to an illumination area to be formed on a mask at a position substantially optically conjugate with said mask; and

an illumination area forming step of forming said illumination area on said mask by projecting said predetermined area onto said mask by using an imaging optical system that is located between the position where the predetermined area is defined and the mask;

said method further comprising:

an adjusting step ~~for~~of adjusting an optical characteristic of said imaging optical system prior to said exposure step.

36. (Amended) A method of manufacturing a microdevice;

said method comprising:

an illumination step of illuminating a mask having a transfer pattern with illumination light; and

an exposure step of exposing said transfer pattern of said mask onto a photosensitive substrate;

said exposure step including a projection step of projecting said transfer pattern of said mask onto said photosensitive substrate by using a projection optical system;

said illumination step including:

an illumination area defining step of defining a predetermined area corresponding to an illumination area to be formed on said mask at a position substantially optically conjugate with said mask; and

an illumination area forming step of forming said illumination area on said mask by projecting said predetermined area onto said mask by using an imaging optical system;

said method satisfying an expression of:

$$0.01 < NA1/(NA2 \times \beta) < 6$$

where NA1 is the maximum numerical aperture of said imaging optical system on a side opposite from said mask side, β is the absolute value of imaging magnification of said imaging optical system, and NA2 is the maximum numerical aperture of said projection optical system on said photosensitive substrate side;

said method further comprising an adjusting step ~~for~~of adjusting an optical characteristic of said imaging optical system prior to said exposure step.

43. (Amended) A method of manufacturing a microdevice,

said method comprising:

~~a step of~~ illuminating a mask having a predetermined pattern by using an illumination optical system including an illumination area forming optical system for forming an illumination area on said mask;

~~a step of~~ exposing a photosensitive substrate by using a projection optical system for projecting a pattern image of said mask onto said photosensitive substrate; and

~~a step of~~ adjusting said illumination optical system;

said method satisfying an expression of:

$$0.01 < NA1 / (NA2 \times \beta) < 6$$

where NA1 is the maximum numerical aperture of said illumination area forming optical system on a light source side, β is the imaging magnification of said illumination area forming optical system, and NA2 is the maximum numerical aperture of said projection optical system on said photosensitive substrate side.